

REMARKS

Claim 21 has been canceled. Claims 1 and 22 have been amended by adding the phrase “in said backbone chains.” Claim 19 has been amended to dependent from claim 1, and also to include the limitations from previously canceled claim 2, from which it used to depend. Applicant believes that no new matter has been introduced by way of these amendments.

Rejections of Claims 21 and 22 Under 35 U.S.C. § 101 and 35 U.S.C. § 112, 2nd

Paragraph

The Examiner has rejected claims 21 and 22 under 35 U.S.C. § 101, contending that these claims do not recite any process steps, and therefore appear to be drawn to a use, which is non-statutory. The Examiner also has rejected claims 21 and 22 under 35 U.S.C. § 112, second paragraph, contending that these claims are unclear because they recite no actual process steps.

Claim 21 has been canceled without prejudice by Applicant, rendering the Examiner’s rejections thereof moot. Claim 22 has been amended by adding the phrase “adding to an aqueous system from which suspended solids have to be separated” to the claim. Applicant believes that the amendment of claim 22 as indicated addresses the Examiner’s rejection thereof under 35 U.S.C. §§ 101 and 112, second paragraph. Based upon the foregoing remarks, Applicant respectfully requests withdrawal of the rejection of claim 22 under Section 101.

Rejections of Claims 1 and 3-22 Under 35 U.S.C. § 112, 1st and 2nd Paragraphs

The Examiner has also rejected claims 1 and 3-22 under 35 U.S.C. § 112, first and second paragraphs, for alleged failure to comply with the written description requirement and as being indefinite, respectively. The Examiner contends that the use of “consist of” language in these claims appears to exclude terminal moieties, which introduces subject matter that is not supported in the specification. The Examiner argues that all polymers have terminating moieties, and therefore, new matter has been introduced as a result of this terminology because the specification does not disclose how to make polymers that “consist of” units I and II.

Though Applicant disagrees with Examiner's reading of the instant claims, in an effort to expedite prosecution, Applicant has amended independent claims 1 and 22 as indicated herein to recite that the copolymers "comprise" the divalent radicals of formulae I and II. Applicant believes that these amendments to claims 1 and 22, along with cancellation of claim 21, obviate the Examiner's rejections of claims 1 and 3-22 under 35 U.S.C. § 112, first and second paragraphs. Based upon the foregoing remarks, Applicant respectfully requests withdrawal of the rejection of claims 1 and 3-22 under Section 112, first and second paragraphs.

Rejection of Claims 1-16 and 19-22 Under 35 U.S.C. § 103(a)

The Examiner has also rejected claims 1-16 and 19-22 under 35 U.S.C. § 103(a) as being unpatentable over Neff *et al.* in US 5,882,525 ("Neff"), in view of Bhattacharyya *et al.* in US 4,713,431 ("Bhattacharyya"). The Examiner contends that Neff discloses a polymer which may contain Applicant's monomer III at column 4, lines 47-58 and a "branching agent" such as PEGDMA of molecular weight 600 (Neff, Experiments 10-11; col. 9, lines 62-65), and that the "materials may be used as flocculants [sic] agents for effluent in the treatment of sludges at column 1, lines 10-39." The Examiner concedes that there are no examples of a material disclosed by Neff that include Applicant's monomers III and IV, and accordingly, the Examiner suggests that the person of ordinary skill in the art would be motivated to modify the disclosure of Neff to arrive at Applicant's invention. In particular, the Examiner suggests that Neff discloses Applicant's amounts of branching agent, i.e. PEGDMA, in combination with Applicant's amounts of bismethacrylate, i.e. DADMAC. Thus, according to the Examiner, it would have been obvious to a person of ordinary skill in the art at the time of the invention to select Applicant's monomers III and IV, in Applicant's amounts, from the disclosure of Neff. In regard to Bhattacharyya, the Examiner contends that there is an admission at page 1, lines 29-33 of the instant specification, because it discloses that the advantage of inverse emulsion polymerization is known in the art for increasing molecular weights of flocculating polymers, and, hence, according to the Examiner, use of inverse emulsion polymerization would have been obvious to a person of ordinary skill in the art at the time of the invention to confer the advantage of increased molecular weight absent any showing of surprising or unexpected results.

Applicant respectfully traverses the Examiner's rejection, and asserts that claims 1-16 and 19-22 are not obvious under 35 U.S.C. § 103(a) over the combination of

Neff and Bhattacharyya relied upon by the Examiner. Applicant points out that the Neff polymer to which the Examiner refers is structurally different from that of the polymers of the instant application. There is nothing in Neff, either alone or in combination with Bhattacharyya, that teaches or suggests the specific selection of Applicant's claimed monomers. Moreover, and contrary to the Examiner's reading of Neff, the relative amount of branching agent in the polymers disclosed by Neff and those claimed in the instant application are distinct, as represented by the recited ranges for that relative amount. Simply stated, the upper limit of Neff's range corresponds to the lower limit of Applicant's range. Further, both Applicant's range and Neff's range each span more than an order of magnitude, namely Neff discloses a relative amount of branching agent from thousandths of a percent to hundredths of a percent, while Applicant's claims recite a range from hundredths of a percent to as much as 20 percent. Moreover, not only is there nothing in Neff to suggest that those ranges should be altered, Neff specifically teaches away from increasing the relative amount of branching agent to levels that coincide with Applicant's invention.

In order for Applicant's invention to be rendered obvious under 35 U.S.C. § 103, the combination of references relied upon by the Examiner must teach each and every element of Applicant's invention, as defined by claims 1-16 and 19-22. As stated in MPEP § 2143.03,

To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

Furthermore, for an obviousness rejection of a claim under 35 U.S.C. § 103(a) to be proper, the claim must be rendered obvious as a whole, and a prior art reference must be considered in its entirety, i.e., including portions that would lead away from the claimed invention (*see, W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984)). Thus, Applicant respectfully points out that the Examiner's obviousness rejection cannot stand for at least the reason that Applicant's entire claimed range of 0.01 to 20 weight percent in the instant claims is not found in any reference proffered by the Examiner.

Neff discloses a relative amount of the branching agent in the exemplified polymers which is substantially below the relative amount of the branching agent in the instant application (*see*, Neff, col. 6, line 5, and Table 2). The branching agent of Neff is used at a far lower concentration of 4-80 mole ppm -- equating to 0.002-0.03 weight percent - - than that claimed in the instant application of 0.01 to 20 weight percent. The Examiner points to the incidental overlap of the upper limit of Neff with the lower limit recited in the instant claims. However, as stated above, that overlap of two hundredths of a percent is insignificant when considering that the ranges being compared each span more than an order of magnitude. In addition, Applicant respectfully reminds the Examiner that the presence of any overlap is not dispositive; it is the entire range that must be rendered obvious by the relied upon references.

The Examiner points to the specific Neff examples using PEGDMA (Neff, Experiments 10-11). Applicant also points out that those examples do not include DADMAC, Applicant's claimed monomer IV. In addition, the relative amount of the branching agent is at the upper limit of the Neff range, which in turn is at the bottom of the range of the instant invention. That upper limit recited by Neff is absolute. In particular, Neff teaches that the concentration of the branching agent must be kept at a minimum, so as to avoid crosslinking, which would render the polymer insoluble in water. Neff states:

As can be seen from Example 1, the incorporation of even extremely small amounts, 5 wppm [i.e. 0.0005%], of branching agent causes insolubilization of the copolymer in the absence of any chain-transfer agent.

(col. 9, lines 32-35, emphasis added). Regarding the use of a chain-transfer agent, Neff teaches that the need to use a chain-transfer agent in the polymerization is essential to further correct for the problems of low molecular weight and/or crosslinking, the latter of which results in gel formation and insolubility in water. Neff states:

Essential to the practice of this invention is the addition of, in optimum concentration, a molecular weight modifying or chain-transfer agent to control structure and solubility of the polymer. In the absence of a chain-transfer agent, the incorporation of even extremely small amounts of branching agent, e.g. 5 parts per million may cause crosslinking, rendering the polymer insoluble in water.

(col. 5, lines 34-40, emphasis added). Furthermore, Neff states:

It is extremely important that optimum concentrations of chain-transfer agent be employed in order to produce a highly branched, water-soluble product. Addition of too little chain-transfer agent produces a non-soluble copolymer product and the addition of too much chain-transfer agent produces a product with too low a solution viscosity, i.e. molecular weight.

(col. 5, lines 49-55, emphasis added). Neff teaches that amounts of branching agent at or exceeding 0.0005%, i.e. nearly 100-fold less than the lower limit claimed by Applicant, leads to unusable polymer. However, Neff also teaches that with the careful selection of chain transfer agents, that amount may be increased, but only to a maximum limit of 0.03%. There is nothing in Neff that points to the instant claims, which include substantially higher amounts of branching agent, without the need to include any chain-transfer agents. Hence, Applicant's lower limit is nearly an order of magnitude above Neff's, and Applicant's upper limit is nearly 3 orders of magnitude above Neff's. The skilled person would not be motivated to ignore the teachings of Neff and increase the relative amount of branching agent by a factor of 10, 100, or 1000. In fact, the opposite is true; Neff specifically teaches away from such a modification.

Returning to Neff's examples 10 and 11 relied upon by the Examiner, Neff discloses those two polymers prepared with 0.005% or 0.01% branching agent, respectively. The latter amount is near, but has not yet reached Neff's upper limit. And yet, that latter polymer is nearly unusable. Neff reports that the CEQ for its example 11 is 45% (Neff, Table 2). Neff clearly indicates that CEQ below 30% is unsuitable, stating, "Use of a chain-transfer agent in concentrations such that the solubility quotient is less than 30 percent provides products that are not soluble. Only when optimum concentrations are used, effectuating a solubility quotient greater than 30 percent, do the polymers exhibit the required solubility characteristics" (col. 6, lines 3-8, emphasis added). Moreover, Neff states that CEQ is preferably above 50%, and ideally above 90% (Neff, col. 6, lines 10-12). Even Neff's improved example 10, having branching agent 2-fold lower than Applicant's claimed lower limit, is not ideal and exhibits a CEQ of only 77%.

Neff is replete with other examples showing that as the branching agent even approaches 0.01%, Applicant's lower limit, the resulting polymers are unusable as evidenced by CEQ. For example, in Table 1, Neff presents results for various series of polymers. In every case, as the branching agent is increased, the CEQ declines, and in most cases precipitously. A particularly dramatic example is shown by examples 5A-5C. There, branching agent lower than 0.002% affords polymers having CEQ above 90%, but those including 0.005% or 0.01%, yield polymers with unacceptable CEQ values of 27% and 14%, respectively. Thus, even by incorporating chain-transfer agents, Neff does not entirely solve the problems that are solved by the instant invention of being able to increase the amount of branching agent.

The instant invention allows for a substantially higher relative amount of the branching monomer than can be imagined from Neff, and does not require the use of chain-transfer agents. Neff makes it clear that venturing above an upper limit of 0.01% branching agent will deliver an unsuitable polymer. Hence, when read as a whole, Neff teaches away from the instant invention, rather than renders it obvious. Applicant has unexpectedly found that the problems of molecular weight and water insolubility may be solved by selecting two specific monomer components, DADMAC and PEGDMA, allowing the concomitant use of higher concentrations of the branching monomer than Neff teaches is possible. Nothing in Neff suggests that careful selection of monomers; indeed Neff does not contain a single example of a polymer prepared from those two monomers. Moreover, after consulting Neff, the skilled person would expect the instant invention to result in gel formation, crosslinking, and a polymer having low or no solubility in water. Thus, there is no motivation to modify the Neff conditions in order to arrive at Applicant's claims reciting high percentages of branching agent.

As an aside, the Examiner attempts to argue that Applicant does include chain transfer agents. Applicant respectfully suggests that the Examiner has misread the instant claims, and misunderstood chain transfer polymerization. The Examiner asserts that chain transfer agents function by providing a moiety to the free radical center at the chain end of a propagating macromolecular chain to simultaneously terminate the chain and generate another free radical for initiating another chain. Further, the Examiner asserts that the chain transfer agent may be no more than a hydrogen radical that will combine with the chain end and would appear in the final product. That assertion is contrary to the accepted meaning of chain transfer polymerization. Simply, a chain transfer agent and reaction conditions constituting chain transfer polymerization are distinct from those simple termination steps.

For example, Neff recites alcohols, mercaptans, thioacids, phosphites and sulfites as chain transfer agents (column 5, lines 44-48). These and other art-recognized chain transfer agents can readily be identified from the literature, even via a cursory search of the internet, and are known in the art to facilitate and significantly enhance chain transfer polymerization leading to polymer structures that are not as easily attainable in the absence of these chain transfer agents. A chain transfer agent is well-understood to avoid high molecular weight without changing overall reaction rate of monomer. To accomplish that dual goal, specific reagents, such as those disclosed by Neff are used. Neff describes the addition of chain-transfer agents at optimum concentrations to be "essential" and "extremely important." In contrast, Applicant's claimed polymers do not require chain transfer agents,

because Applicant has carefully selected monomers III and IV, resulting in the claimed polymers comprising I and II. Simply stated, the person of ordinary skill in the art would not modify the Neff conditions in the way that the Examiner suggests, because to do so would be to ignore the teachings of Neff. Neff teaches away from Applicant's invention.

Finally, the Examiner suggests that the person of ordinary skill in the art would combine the teachings of Bhattacharyya with Neff to arrive at Applicant's invention. Applicant respectfully disagrees. Bhattacharyya merely describes the preparation of high molecular weight DADMAC polymers by copolymerizing DADMAC and a very small proportion of acrylamide, a branching agent, using an inverse emulsion polymerization technique in the presence of a free radical initiator and an emulsifier. The Examiner's reliance on that reference is unavailing, because Bhattacharyya does nothing to overcome the insufficiencies of Neff. Bhattacharyya is silent to Applicant's branching agent, and to Applicant's claimed range. Further, nothing in Bhattacharyya can serve to undo the explicit teaching away found in Neff. Therefore, even after citing Bhattacharyya, Applicant respectfully asserts that the Examiner has failed to provide a basis for a rejection under Section 103(a), because the Examiner has failed to provide a combination of references that teaches each and every element of Applicant's invention, as required according to MPEP § 2143.03. Moreover, because Neff makes it clear that chain transfer polymerization is "essential" and "extremely important," the person of ordinary skill in the art would not ignore that teaching, a critical element of the Neff polymers, and instead rely on inverse emulsion polymerization. The Examiner's suggesting to the contrary conflicts with the requirement that the Neff reference be considered in its entirety, including portions that would lead away from the claimed invention (*Gore*, 721 F.2d 1540). Accordingly, Applicant suggests that the combination of Neff and Bhattacharyya is improper because the skilled artisan would not look to Bhattacharyya to solve the problems in Neff.

Based upon the foregoing remarks, Applicant respectfully requests withdrawal of the rejection of claims 1-16 and 19-22 under 35 U.S.C. § 103(a).

CONCLUSION

The foregoing amendments and remarks are believed to fully respond to the Examiner's rejections, and Applicant believes that the claims are now in condition for allowance. Applicant respectfully requests the withdrawal of each of the standing rejections, allowance of the instant claims, and passage of the application to issuance.

Applicant petitions for a two-month extension of time under 37 C.F.R. § 1.136(a), extending the due date for response until November 17, 2008. The Commissioner is hereby authorized to charge the two-month extension fee of \$490.00 as set forth in 37 C.F.R. § 1.17(a)(2). If additional fees are required with this Response, the Commissioner is hereby authorized to charge the same to Barnes & Thornburg LLP Deposit Account No. 10-0435, with reference to our matter number 127-75824.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Richard D. Conard", written in a cursive style.

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